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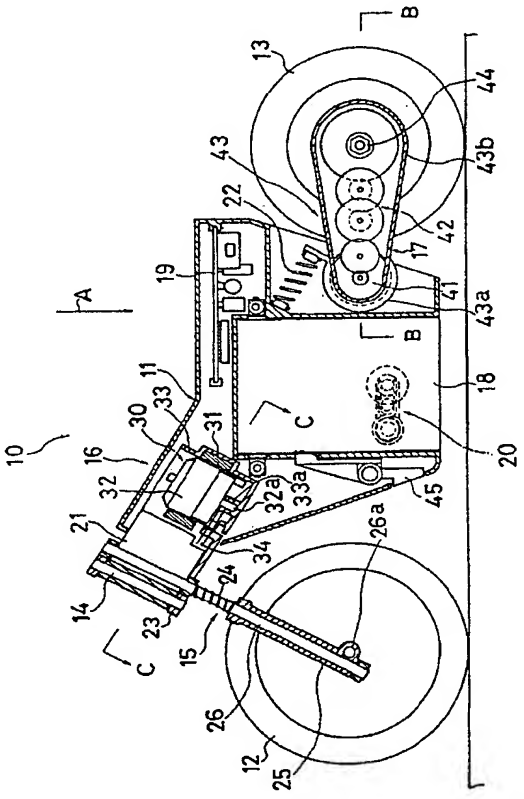
(54) Steering system of radio controlled two-wheeled vehicle toy

(57) The toy comprises: a body 11; a caster axle 14 mounted on a front end of the body 11 so as to be tilted backward from the vertical; a front fork 15 which is rotatable on the caster axle 14 and rotatably supports a front wheel 12; a rear-wheel drive portion 17 for driving a rear wheel 13; a radio-control receiver 19 and a battery 18 mounted in the body 11; and, a pair of auxiliary wheels 20. Mounted in a front-end portion of the body 11 of the toy is a steering unit 16 comprising: a steering mechanism 30 which produces a control torque for rotating the front fork 15 based on a control signal issued from the receiver 19; and, a resilient means 34 for resiliently transmitting the control torque to the front fork 15.

FIG. 1



EP 0 694 323 A1

Description

BACKGROUND OF THE INVENTION

Field of the Invention:

The present invention relates to a steering system of a radio controlled two-wheeled vehicle toy, and more particularly to a steering system of a radio controlled two-wheeled vehicle toy remotely controlled in travel direction.

Description of the Prior Art:

Conventional steering systems of the remotely-controlled two-wheeled vehicle toys are generally classified into two well-known types: one of which causes a front fork portion of the vehicle toy to turn right and left so that the center of gravity of the vehicle toy is displaced; and, the other of which types causes a predetermined weight element (for example, such as an electric power unit and the like mounted in a body of the vehicle toy) to swing right and left so that the center of gravity of the vehicle toy is displace.

However, the conventional steering systems having the above construction present difficult problems as follows:

Namely, the two-wheeled vehicle toy, which is provided with any one of the conventional steering systems having the above constructions, depends on the displacement of the center of gravity of the vehicle toy when the vehicle toy makes turns. On the other hand, when the vehicle toy travels at high speed, the vehicle toy is subjected to a large force to keep the course of the vehicle toy straight, which force acts adversely on a turning effort of the vehicle toy to seriously impair the vehicle toy in maneuverability.

In addition, any one of the conventional steering systems having the above constructions requires a large force to realize the displacement of the center of gravity of the vehicle toy in making turns, and, therefore requires a servo-mechanism comprising a motor, reduction gears and an electric circuit for controlling a steering angle of the vehicle toy, which increases the manufacturing cost of the steering system of the vehicle toy.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a steering system of a radio controlled two-wheeled vehicle toy, which is small in the number of its parts, easy in assembly operations thereof and excellent in maneuverability.

According to a first aspect of the present invention, the above object of the present invention is accomplished by providing:

In a steering system of a radio controlled two-wheeled vehicle toy comprising: a vehicle body frame; a caster axle mounted on a front end of the vehicle body frame so as to be tilted backward from the vertical; a front fork which is rotatable on the caster axle and rotatably supports a front wheel; a rear-wheel drive portion for driving a rear wheel; a radio-control receiver and a battery serving as an electric power source both mounted in the vehicle body frame; and, auxiliary wheel means mounted on opposite sides of the vehicle body frame so as to be brought into contact with the ground when the vehicle body frame leans;

the improvement wherein:

the steering system is mounted in a front-end portion of the vehicle body frame and comprises: a steering mechanism which produces a control torque for rotating the front fork based on a control signal issued from the receiver; and, a resilient means for resiliently transmitting the control torque to the front fork.

According to a second aspect of the present invention, the above object of the present invention is accomplished by providing:

The steering system of the radio controlled two-wheeled vehicle toy, as set forth in the first aspect of the present invention, wherein:

the steering mechanism is constructed of a magnetic coil disposed inside a ring-like magnet for producing the control torque based on a control electric current issued from the receiver; and

the resilient means is constructed of a U-shaped torsion spring mounted on a fixed portion of the vehicle body frame so as to be provided with a pair of leg portions through one of which the control torque produced in the magnetic coil is transmitted to the other of the leg portions of the resilient means through which the control torque is resiliently transmitted to the front fork.

According to a third aspect of the present invention, the above object of the present invention is accomplished by providing:

The steering system of the radio controlled two-wheeled vehicle toy, as set forth in the first aspect of the present invention, wherein:

the steering mechanism is constructed of a servo-motor provided with a swingable arm for producing the control torque based on the control electric current issued from the receiver; and

the resilient means is constructed of a pair of tension coil springs each of which is disposed between each of opposite ends of the swingable arm of the servo-motor and each of symmetrical portions of the front fork which are symmetrical with respect to the caster axle, so that the control torque of the swingable arm of the servo-motor is resiliently transmitted to the front fork through the tension coil springs.

According to a fourth aspect of the present invention, the above object of the present invention is accomplished by providing:

The steering system of the radio controlled two-wheeled vehicle toy, as set forth in the first aspect of the present invention, wherein:

The steering system of the radio controlled two-wheeled vehicle toy, as set forth in claim 1, wherein the steering system is constructed of: a magnetic coil which is energized with the control electric current to produce an attracting force or a repelling force with respect to a magnet; the magnet attracted or repelled by the magnetic coil when the magnetic coil is energized with the control electric current; and a connecting rod through which the magnet is connected with the front fork, through which connecting rod the attracting force or the repelling force produced between the magnetic coil and the magnet is resiliently transmitted to the front fork.

In the steering system of the present invention having the above construction, since the steering system is mounted in the front-end portion of the vehicle body frame and comprises the steering mechanism (which produces the control torque for rotating the front fork based on the control signal issued from the receiver) and the resilient means for resiliently transmitting the control torque to the front fork, when the vehicle toy tends to fall down, for example, to the left while keeping on the course, the front wheel of the vehicle toy turns to the left so as to push the body of the vehicle toy to the right. On the other hand, when the vehicle toy tends to fall down to the right while keeping on the course, the front wheel of the vehicle toy turns to the right so as to push the body of the vehicle toy to the left. As a result, the vehicle toy recovers its balance while keeping on the course. When the vehicle toy makes turns, a small amount of the control torque is applied to the front fork of the vehicle toy so that the vehicle toy slightly loses its balance while keeping on the course, whereby the vehicle toy makes necessary turns. Such small amount of the control torque is easily available in electromagnets and the like. In addition, it is also possible to use the force of the vehicle's falling-down as a force for having the vehicle toy make turns, which considerably improves the vehicle toy in maneuverability.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a longitudinal sectional side view of the two-wheeled vehicle toy of a first embodiment of the present invention;

Fig. 2 is a plan view of a central portion of the vehicle toy of the present invention, looking in the direction of the arrow "A" of Fig. 1;

Fig. 3 is an enlarged cross-sectional view of a rear portion of the vehicle toy of the present invention, taken along the line B-B of Fig. 1;

Fig. 4 is an enlarged cross-sectional view of a front portion of the vehicle toy of the present invention, taken along the line C-C of Fig. 1;

Fig. 5 is a view illustrating in operation the steering system of the first embodiment of the present invention when the vehicle toy keeps on the course;

Fig. 6 is a view illustrating in operation the steering system of the first embodiment of the present invention when the vehicle toy begins to make a left turn;

Fig. 7 is a view illustrating in operation the steering system of the first embodiment of the present invention during the left turn;

Fig. 8 is a view illustrating in operation the steering system of the first embodiment of the present invention when the vehicle toy completes the left turn to return to its straightforward travel;

Fig. 9 is a rear view of the vehicle toy of the first embodiment of the present invention during the straightforward travel;

Fig. 10 is a rear view of the vehicle toy of the first embodiment of the present invention in the beginning of the left turn;

Fig. 11 is a rear view of the vehicle toy of the first embodiment of the present invention during the left turn;

Fig. 12 is a rear view of the vehicle toy of the first embodiment of the present invention when the vehicle toy completes the left turn to return to its straightforward travel;

Fig. 13 is a view illustrating a second embodiment of the steering system of the present invention; and

Fig. 14 is a view illustrating a third embodiment of the steering system of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinbelow, the present invention will be described in detail with reference to the accompanying drawings.

Figs. 1 to 4 show a first embodiment of a two-wheeled vehicle toy of the present invention, wherein: Fig. 1 shows a longitudinal sectional side view of the vehicle toy; Fig. 2 a plan view of the vehicle toy, looking in the direction of the arrow "A" of Fig. 1; Fig. 3 an enlarged cross-sectional view of the vehicle toy, taken along the line B-B of Fig. 1; and, Fig. 4 an enlarged cross-sectional view of the vehicle toy, taken along the line C-C of Fig. 1. Incidentally, a handle bar and like parts, which do not relate to the present invention, will be omitted in the following description.

As shown in the drawings, a radio controlled two-wheeled vehicle toy 10 of the present invention com-

prises: a vehicle body frame 11; a front wheel 12 and a rear wheel 13 mounted on a front and a rear portion of the vehicle body frame 11, respectively; a front fork 15 which is rotatable on a caster axle 14 mounted on a front-end portion of the vehicle body frame 11 so as to be tilted backward from the vertical, and rotatably supports the front wheel 12; a steering unit 16 for controlling the front fork 15 in direction; a rear-wheel drive portion 17 for driving the rear wheel 13; a battery 18 serving as an electric power source of the vehicle toy 10; a radio-control receiver 19 for controlling both the steering unit 16 and the rear-wheel drive portion 17; and, an auxiliary wheel unit 20 provided with a pair of auxiliary wheels 53 which are brought into contact with the ground when the vehicle toy 10 leans sideward from the vertical by a predetermined angle.

The vehicle body frame 11 is made of plastics and like materials, assumes a narrow box-like shape having its front portion tilted slightly upward, and is divided into three sections: a central one for receiving the battery 18 therein; an rear one (which is partially disposed over the central one) for receiving a circuit board of the receiver 19 therein; and, a front one (i.e., front portion slightly tilted upward of the vehicle body frame 11) for receiving the steering unit 16 therein. Projected forward from the front-end portion of the vehicle body frame 11 is an arm portion 21 of a casing 33 of the steering unit 16 described later. The arm portion 21 is integrally formed with the casing 33. The caster axle 14 is mounted in a front-end portion of the arm portion 21 of the casing 33 so as to be tilted backward from the vertical by an angle of, for example, 30°. On the other hand, the rear-wheel drive portion 17 is mounted on a lower area of the rear portion of the vehicle body frame 11 through a buffer spring 22 which absorbs shocks caused by irregularities in the road and the like through the rear wheel 13.

As is clear from Fig. 1, the front fork 15 is constructed of a fork holder 23, a pair of parallel springs 24, a pair of parallel outer pipes 25, and a pair of parallel inner shafts 26. As shown in Fig. 4, the fork holder 23 is provided with: a shaft-mounting portion 23a for fixedly mounting the inner shafts 26 therein, which portions 23a assumes a substantially-triangular flat plate-like shape; a handle arm portion 23b projecting rearward from a central area of the shaft-mounting portion 23a; and, an abutting portion 23c formed in a rear-end area of the handle arm portion 23b. The shaft-mounting portion 23a of the fork holder 23 has its front-end portion mounted on the caster axle 14 so as to be rotatable thereon. The pair of parallel inner shafts 26 are fixedly mounted on the opposite rear ends of the shaft-mounting portion 23a so as to be symmetrically arranged with respect to the center line of the shaft-mounting portion 23a. Each of the parallel inner shafts 26 has its lower portion slidably mounted in each of the parallel outer pipes 25. On the other hand, each of the parallel springs 24 is interposed between a lower surface of the shaft-mounting portion 23a of the fork holder 23 and an upper end of each of the parallel outer pipes 25 to absorb shocks caused by irregularities in the road and the like through the front wheel 12. Formed in a lower-end portion of each of the outer pipes 25 is a bearing portion 26a in which the front wheel 12 is rotatably mounted. Consequently, the front fork 15 resiliently supports the front wheel 12 so as to absorb the shocks transmitted through the front wheel 12, is rotatably mounted on the caster axle 14, and receives a control torque for steering the vehicle toy 10 as described later, which torque is produced in the steering unit 16.

The steering unit 16 is provided with a steering mechanism 30 for producing the control torque by the use of which the vehicle toy 10 is remotely controlled in travel direction. The steering mechanism 30 is constructed of a ring-like permanent magnet (hereinafter simply referred to as the ring-like magnet) 31 and a magnetic coil 32 which is disposed inside the ring-like magnet 31 and controlled by applications of electric current issued from the receiver 19. Both the ring-like magnet 31 and the magnetic coil 32 are housed in the casing 33, with a torsion spring 34 which acts as a resilient coupling or means. This casing 33 is mounted in the front portion of the vehicle body frame 11. A central axle 32a is provided in a central portion of a lower area of the magnetic coil 32 to protrude downward, in which lower area an operation pin 32b and a stopper pin 32c are further provided so as to be diametrically opposed to each other in arrangement and protrude downward. On the other hand, the ring-like magnet 31 has its center axis arranged in parallel with the caster axle 14, and is fixedly mounted in the casing 31. The magnetic coil 32 has its central axle 32a inserted into a protruding bearing portion 33a of the casing 33 so as to be rotatably mounted in the casing 33. As shown in Fig. 6, a pair of stopper portions 33b of the casing 33 are symmetrically arranged with respect to a longitudinal center line of the vehicle body frame 11 so as to restrict rotation of the magnetic coil 32 within a predetermined angular range. Further mounted on the bearing portion 33a of the casing 33 is the torsion spring 34 which assumes a substantially U-shaped form provided with a left leg portion 34a and a right leg portion 34b, as viewed in Fig. 4. The operation pin 32b of the magnetic coil 32 is disposed between these leg portions 34a and 34b of the torsion spring 34. Also disposed between these leg portions 34a and 34b of the torsion spring 34 is the abutting portion 23c of the fork holder 23, which engages with front areas of these leg portions 34a, 34b in operation. Incidentally, in Fig. 4, the arrow D shows a travel direction of the vehicle toy 10.

As shown in Fig. 1, the rear-wheel drive portion 17 of the vehicle toy 10 is constructed of: a drive motor 41; a speed-reduction unit 42 constructed of gear trains driven by the drive motor 41; a drive casing 43 housing both the drive motor 41 and the speed-reduction unit 42 therein. The drive casing 43 is partitioned into two casing areas 43a, 43b: the first one 43a for housing the drive motor 41 therein; and, the second one 43b for housing the speed-reduction unit 42 therein. The first casing area

43a is rotatably mounted on the rear portion of the vehicle body frame 11, and resiliently supported by the buffer spring 22 which absorbs shocks caused by irregularities in the road and the like through the rear wheel 13. On the other hand, the second casing area 43b extends rearward from the first casing area 43a, as shown in Fig. 1. A drive shaft 44 is provided in a final gear of the speed-reduction unit 42, on which drive shaft 44 the rear wheel 13 is fixedly mounted.

The battery 18 supplies electric current to each of the receiver 19, drive motor 41, steering mechanism 30 and the like, and is detachably mounted in the central portion of the vehicle body frame 11 through a battery lock unit 45.

On the other hand, the auxiliary wheel unit 20 is provided with the pair of auxiliary wheels 53 which are brought into contact with the ground when the vehicle toy 10 leans sideward from the vertical by a predetermined angle. Namely, the auxiliary wheel unit 20 is constructed of: a pair of mounting-bracket boss members 51 rotatably mounted on opposite sides the central portion of the vehicle body frame 11 so as to be disposed in slightly lower areas of the opposite sides, each of which boss members 51 assumes a substantially L-shaped form; a pair of torsion springs 52 each of which resiliently and rotatably supports each of the boss members 51; and, the pair of the auxiliary wheels 53 each of which is rotatably mounted on a free-end axle portion of each of the boss members 51. The auxiliary wheels 53 are so arrange as to be brought into contact with the ground when the vehicle toy 10 leans sideward from the vertical by a predetermined angle, for example, by an angle of 30°.

Now, operation of the vehicle toy 10 of the present invention will be described with reference to the drawings in which: Figs. 5 to 8 show operation of the steering unit 16; and, Figs. 9 to 12 show rear views of the vehicle toy 10 in travel, illustrating travel conditions of the vehicle toy 10 corresponding to the operation of the steering unit 16.

When a radio-control transmitter (not shown) emits a signal for actuating the drive motor 41, the receiver 19 receives the signal to permit the battery 18 to supply electric current to the drive motor 41, so that the vehicle toy 10 begins to travel. In keeping on the course straight in travel, the vehicle toy 10 has the magnetic coil 32 of the steering mechanism 30 thereof supplied with no electric current, so that the magnetic coil 32 remains stationary to assume the position as shown in Fig. 5. In this condition, when the vehicle toy 10 leans, to the left (for example), the front wheel 12 also leans to the left to produce a force pushing the vehicle body frame 11 to the right due to a so-called caster effect, so that the vehicle toy 10 recovers its balance. On the other hand, when the vehicle toy 10 leans to the right, the front wheel also leans to the right to produce a force pushing the vehicle body frame 11 to the left due to the caster effect, so that the vehicle toy 11 recovers its balance. As a result, the vehicle toy 10 may keeps on the course straight in travel.

In making a left turn, the vehicle toy 10 receives a left-turn signal emitted from the radio-control transmitter (not shown). As a result, the receiver 19 of the vehicle toy 10 issues a signal causing the battery 18 to supply electric current to the magnetic coil 32, so that the magnetic coil 32 turns counterclockwise to produce a control torque until its stopper pin 32c abuts against the stopper portion 33b of the casing 33. As a result, the operation pin 32b of the magnetic coil 32 abuts against the left leg portion 34a of the torsion spring 34 to cause the torsion spring 34 to rotate counterclockwise, so that an inner surface of the right leg portion 34b of the torsion spring 34 abuts against the abutting portion 23c of the fork holder 23, whereby the fork holder 23 is rotated clockwise on the caster axle 14, as shown in Fig. 6. As a result, the front wheel 12 is slightly turned to the right to have the vehicle toy 10 lose its balance, so that the the vehicle body frame 11 is subjected to a leftward centrifugal force, whereby the vehicle body frame 11 tends to fall to the left, as shown in Fig. 10.

As a result, the front wheel 12 is subjected to a force causing the front wheel 12 to turn to the left on the caster axle 14, so that the vehicle toy 10 leans leftward to make a left turn. In this condition, as shown in Fig. 7: the fork holder 23 rotates counterclockwise on the caster axle 14; the torsion spring 34 has the inner surface of its left leg portion 34a abut against the operation pin 32b of the magnetic coil 32, and has the inner surface of its right leg portion 34b abut against the abutting portion 23c of the fork holder 23, so that the torsion spring 34 has its leg portions 34a, 34b opened as a whole. Due to the presence of a resilient force exerted by the torsion spring 34, as shown in Fig. 7, an actual left-turn angle "b" of the front wheel 12 is slightly smaller than an apparent left-turn angle "a" corresponding to both the travel speed and the banking angle of the vehicle toy 10, so that the vehicle body frame 11 is continuously subjected to a force causing the vehicle toy 10 to fall to the left. As a result, the vehicle toy 10 continues its left turn even after the vehicle toy 10 reaches a predetermined banking condition in which its auxiliary wheels 53 are brought into contact with the ground.

When the vehicle toy 10 returns to its straight travel, the radio-control transmitter (not shown) emits a signal for preventing the vehicle toy 10 from continuing the turn. Upon receipt of the above signal, the receiver 19 issues a signal for preventing the battery 18 from supplying the electric current to the magnetic coil 32 of the steering mechanism 30 so that the control torque produced in the magnetic coil 32 is removed to permit the torsion spring return to its initial position, whereby the abutting portion 23c of the fork holder 23 is free from any external force. Consequently, since the force, which is exerted by the torsion spring 34 to have the actual angle "b" be smaller than the apparent angle "a", is removed, it is possible for the fork holder 23 to freely turn on the caster axle 14 so as to have the apparent angle "a" corresponding to the

travel speed and the banking angle of the vehicle toy 10. Further, due to the caster effect, the vehicle toy 10 is subjected to a recovering force indicated by the arrow in Fig. 12 to return to its straight travel, as shown in Fig. 9.

In making a right turn, a right-turn signal is emitted by the radio-control transmitter (not shown). When the signal is received by the receiver 19, the receiver 19 issues a signal permitting the magnetic coil 32 to turn clockwise, so that the vehicle toy 10 makes the right turn in the same way as described above.

Incidentally, the auxiliary wheel unit 20 prevents the vehicle toy 10 from falling on the ground, and further permits the vehicle toy 10 to begin moving from its stationary condition. The torsion springs 52, which serve as buffer means, are provided for absorbing shocks caused by irregularities in the road and the like through the auxiliary wheels 53.

As described above, when the vehicle toy 10 makes turns by the use of the steering system of the present invention, it suffices to apply a small control torque to the fork holder 23 of the vehicle toy 10 so as to have the vehicle toy 10 slightly lose its balance during its straight travel. Consequently, in making turns, the vehicle toy 10 does not require a large control torque, which permits the vehicle toy 10 to use an electromagnet and like elements as its power source. Further, in the vehicle toy 10 of the present invention, in making turns, since the vehicle toy 10 slightly loses its balance intentionally to produce and utilize a force having the vehicle toy 10 fall on the ground, it is possible to considerably improve the steering system of the present invention in response.

Fig. 13 shows a second embodiment of the steering unit of the present invention, and Fig. 14 shows a third embodiment of the steering unit of the present invention. Incidentally, in any of the second and the third embodiment of the steering unit of the present invention, parts similar to those of the first embodiment of the present invention are denoted by the same reference numerals and characters as those used in the first embodiment.

In the first embodiment of the present invention, the ring-like magnet 31 and the magnetic coil 32 serve as the steering mechanism 30 and the torsion spring 34 serves as a means for producing the control torque. In contrast with this, in the second embodiment of the present invention, as shown in Fig. 13, the steering mechanism is constructed as a servo-motor 51 and a pair of tension coil springs 52 are used as a resilient means in place of the torsion spring 34 of the first embodiment. Namely, the tension coil springs 52 are mounted between opposite ends of a swingable arm 53 and a pair of symmetrical positions of the fork holder 23', which positions are symmetrical with respect to a center line of the fork holder 23' passing through the caster axle 14. In the second embodiment of the present invention having the above construction, in making a left turn, the swingable arm 53 of the servo-motor 51 is rotated clockwise to have the front wheel 12 turn to the left. At this time, due to the presence of a resilient force exerted by one of the tension coil springs 52, as already described with reference to Fig. 7 in the first embodiment, an actual left-turn angle "b" (shown in Fig. 7) of the front wheel 12 is slightly smaller than an apparent left-turn angle "a" corresponding to both the travel speed and the banking angle of the vehicle toy 10, so that the vehicle body frame 11 is continuously subjected to a force causing the vehicle toy 10 to fall to the left. As a result, the vehicle toy 10 continues its left turn as is in the case of the first embodiment of the present invention. When the vehicle toy 10 returns to its straight travel, the servo-motor 51 is prevented from being supplied with electric current to permit the fork holder 23' to freely rotate on the caster axle 14, whereby the vehicle toy 10 returns to its straight travel (as shown in Fig. 9).

In the third embodiment of the present invention, as shown in Fig. 14, the torsion spring 34 is replaced with an assembly of a solenoid 61 and a magnet 62. An operation rod 63 has one of its opposite ends connected with the magnet 62 and the other connected with a portion of the fork holder 23'. In operation, electric current is applied to the solenoid 61 so as to have the solenoid 61 attract or repel the magnet 62, whereby the fork holder 23' is rotated on the caster axle 14. Due to the presence of such attracting or repelling force exerted by the assembly 61, 62 in place of the torsion spring 34, an actual left-turn angle "b" (shown in Fig. 7) of the front wheel 12 is slightly smaller than an apparent left-turn angle "a" corresponding to both the travel speed and the banking angle of the vehicle toy 10, so that the vehicle body frame 11 is continuously subjected to a force causing the vehicle toy 10 to fall to the left. As a result, the vehicle toy 10 continues its left turn as is in the case of the first embodiment of the present invention.

In each of the above embodiments of the present invention, it is possible to use any of the ring-like magnet, electromagnet, servo-motor, or the assembly thereof.

Incidentally, it should be understood that those skilled in the art could accomplish modifications within the scope of the present invention, and, accordingly the present invention should be measured from the following claims.

As described above, as for the steering system of the two-wheeled vehicle toy of the present invention, there is provided a servo-mechanism in the front portion of the vehicle body frame. The servo-mechanism produces the control torque for resiliently control the front fork of the vehicle toy in rotation. Consequently, during the straight travel, when the vehicle toy tends to fall to the left, the front wheel leans to the left to produce a force pushing the vehicle body frame to the right. In contrast with this, when the vehicle toy tends to fall to the right, the front wheel leans to the right to produce a force pushing the vehicle body frame to the left. As a result, the vehicle toy recovers its balance during the straight travel. In making turns, it suffice to apply a small control torque to the fork holder of the vehicle toy to have the toy slightly lose its balance during the straight travel, which permits

the electromagnet to serve as the power source of the steering system of the present invention. Further, in making turns, since the vehicle toy utilizes the force having the toy lose its balance, the vehicle toy of the present invention is excellent in responsibility in operation. As is clear from the above, the steering system of the present invention is small in the number of its components, easy in its assembly operations, and low in manufacturing costs.

Claims

1. In a steering system of a radio controlled two-wheeled vehicle toy comprising: a vehicle body frame; a caster axle mounted on a front end of said vehicle body frame so as to be tilted backward from the vertical; a front fork which is rotatable on said caster axle and rotatably supports a front wheel; a rear-wheel drive portion for driving a rear wheel; a radio-control receiver and a battery serving as an electric power source both mounted in said vehicle body frame;

   the improvement wherein:

   said steering system is mounted in a front-end portion of said vehicle body frame and comprises: a steering mechanism which produces a control torque for rotating said front fork based on a control signal issued from said receiver; and, a resilient means for resiliently transmitting said control torque to said front fork.

2. The steering system of the radio controlled two-wheeled vehicle toy, as set forth in claim 1, wherein:

   said steering mechanism is constructed of a magnetic coil disposed inside a ring-like magnet for producing said control torque based on a control electric current issued from said receiver; and

   said resilient means is constructed of a U-shaped torsion spring mounted on a fixed portion of said vehicle body frame so as to be provided with a pair of leg portions through one of which said control torque produced in said magnetic coil is transmitted to the other of said leg portions of said resilient means through which said control torque is resiliently transmitted to said front fork.

3. The steering system of the radio controlled two-wheeled vehicle toy, as set forth in claim 1, wherein:

   said steering mechanism is constructed of a servo-motor provided with a swingable arm for producing said control torque based on said control electric current issued from said receiver; and

   said resilient means is constructed of a pair of tension coil springs each of which is disposed between each of opposite ends of said swingable arm of said servo-motor and each of symmetrical portions of said front fork which are symmetrical with respect to said caster axle, so that said control torque of said swingable arm of said servo-motor is resiliently transmitted to said front fork through said tension coil springs.

4. The steering system of the radio controlled two-wheeled vehicle toy, as set forth in claim 1, wherein

   said steering system is constructed of: a magnetic coil which is energized with said control electric current to produce an attracting force or a repelling force with respect to a magnet; said magnet attracted or repelled by said magnetic coil when said magnetic coil is energized with said control electric current; and a connecting rod through which said magnet is connected with said front fork, through which connecting rod said attracting force or said repelling force produced between said magnetic coil and said magnet is resiliently transmitted to said front fork.

5. The steering system of the radio controlled two-wheel vehicle toy as claimed in any one of claims 1 to 4, wherein said vehicle toy further comprises:

   auxiliary wheel means mounted on opposite sides of said vehicle body frame so as to be brought into contact with the ground when said vehicle body frame leans.

FIG. 1

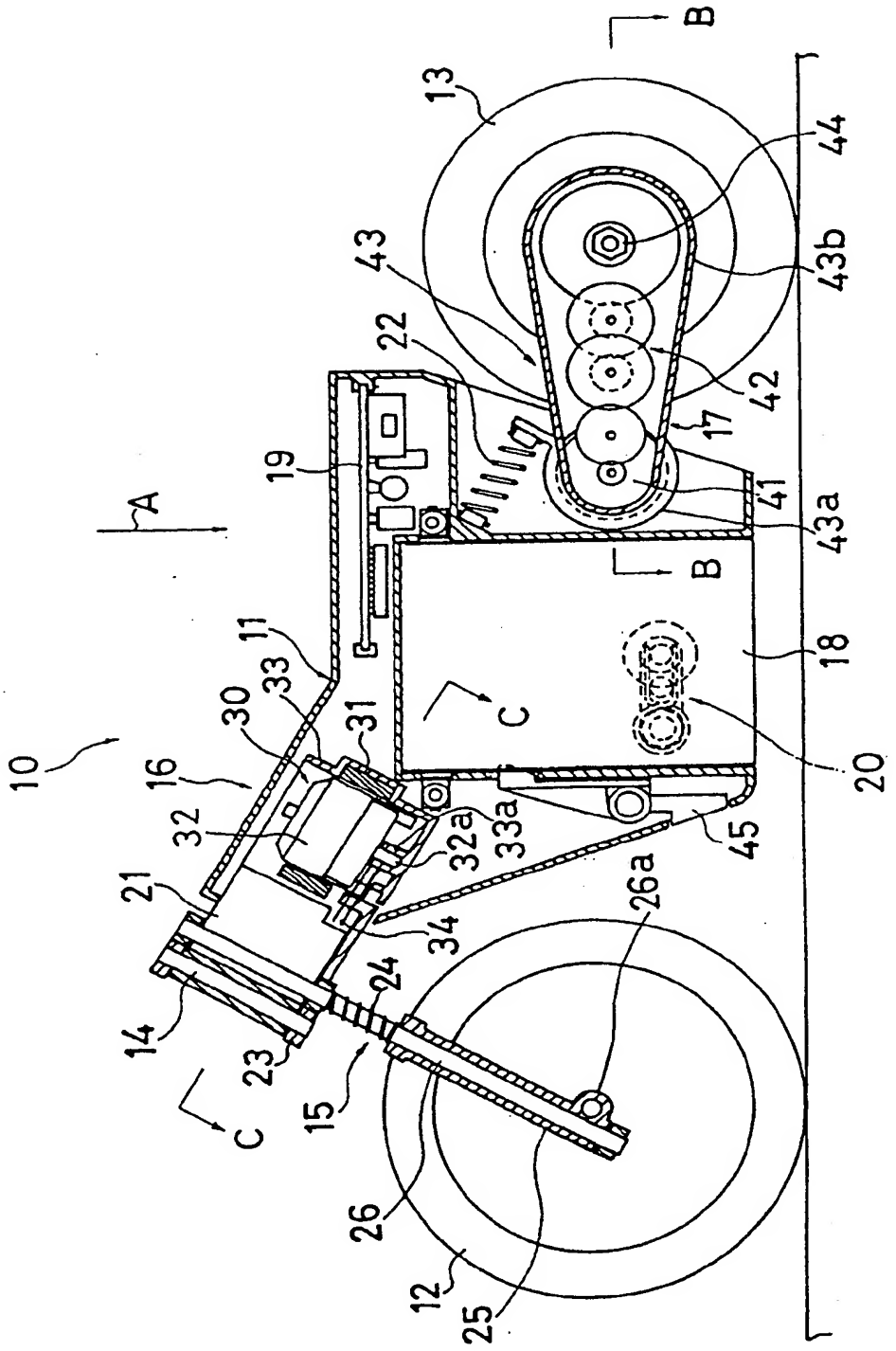

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FIG. 2

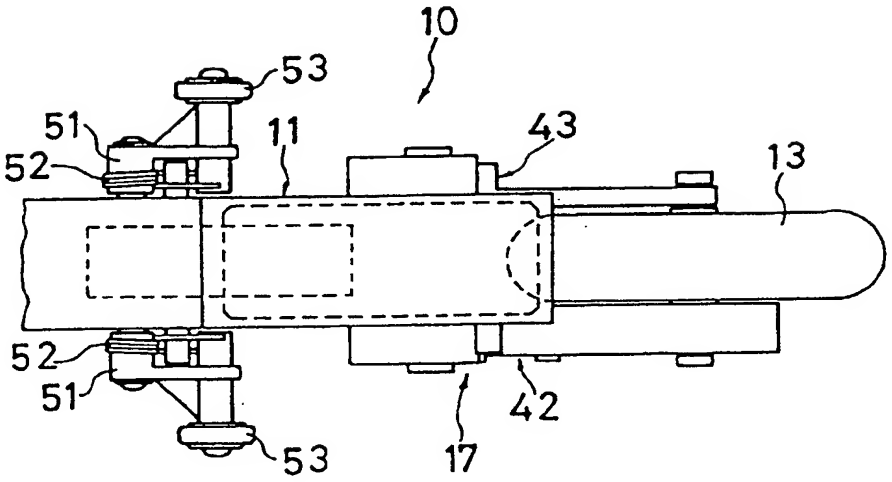


FIG. 3

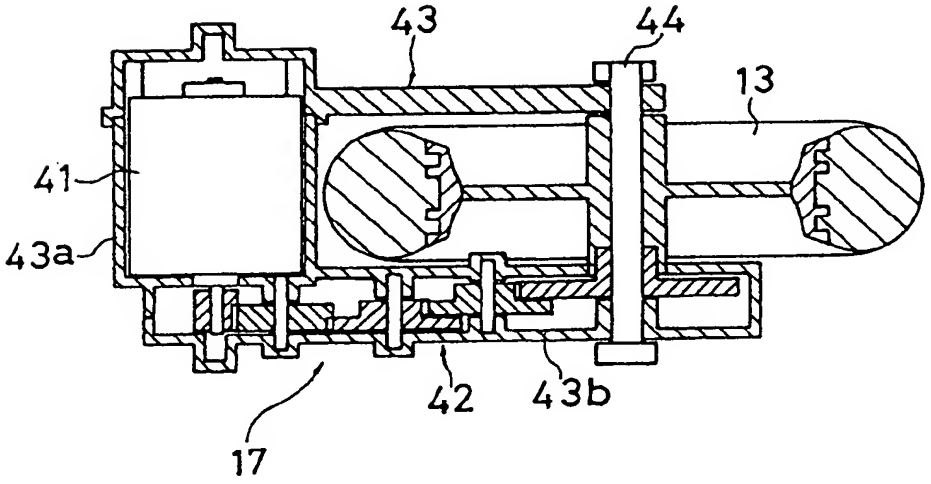
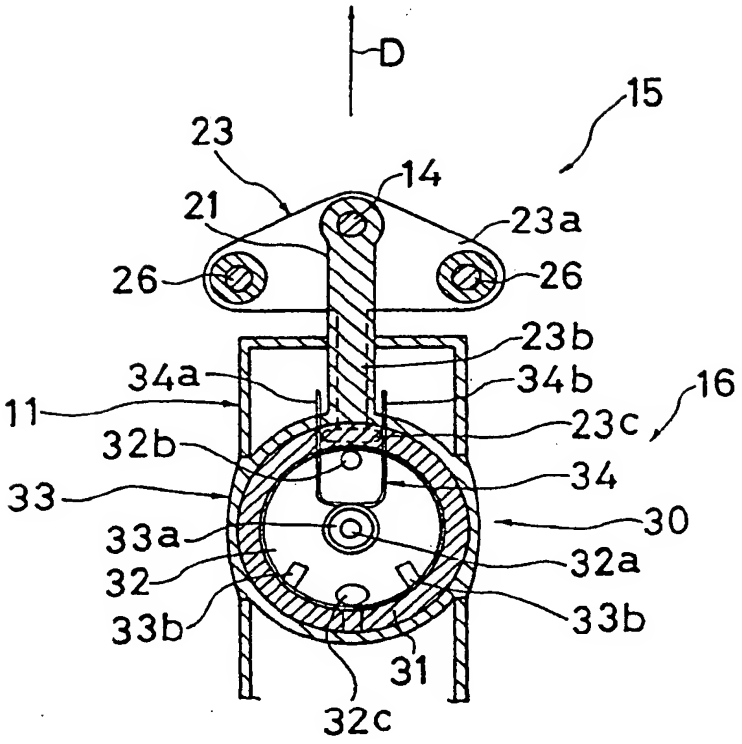


FIG. 4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23a
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23b
34a
34b
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23c
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32a
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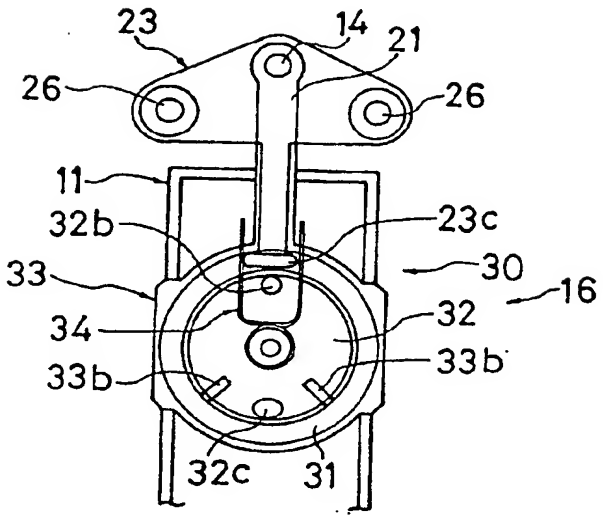
33b
33b
31
32c

FIG. 5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32c
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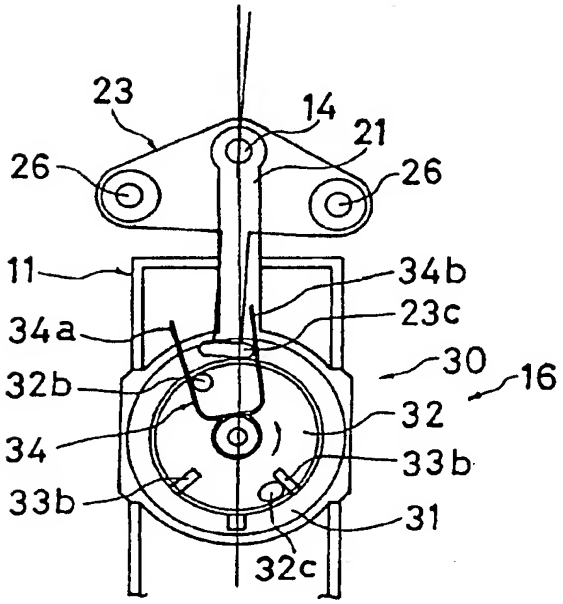
FIG. 6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33b
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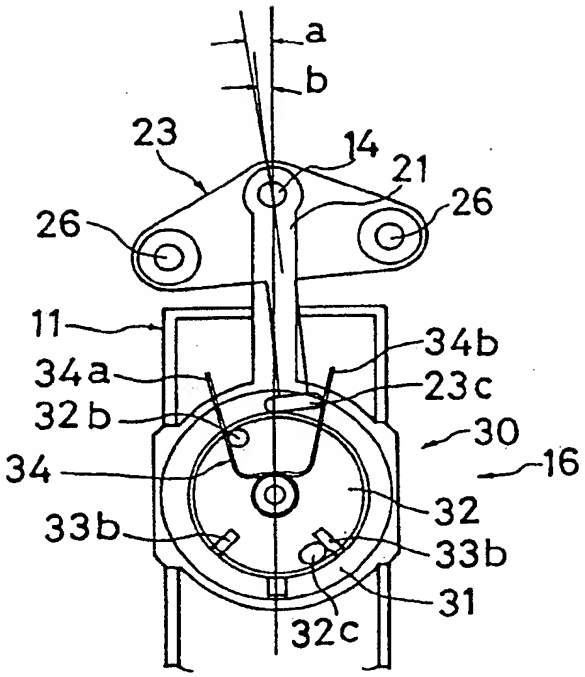
32c

FIG. 7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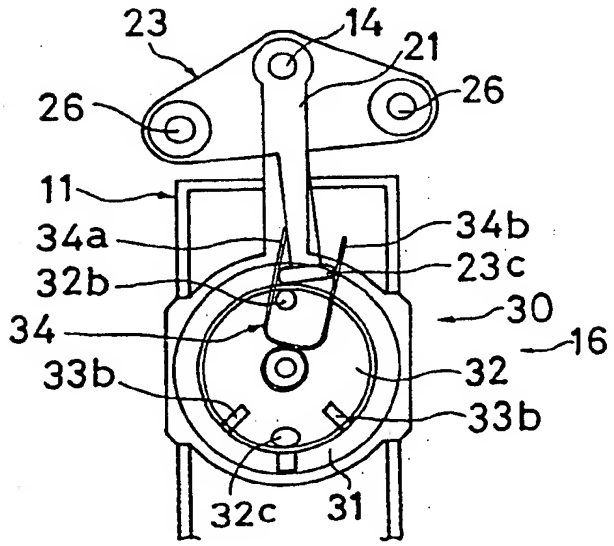
32c

FIG. 8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32b
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33b
33b
32c
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FIG. 9

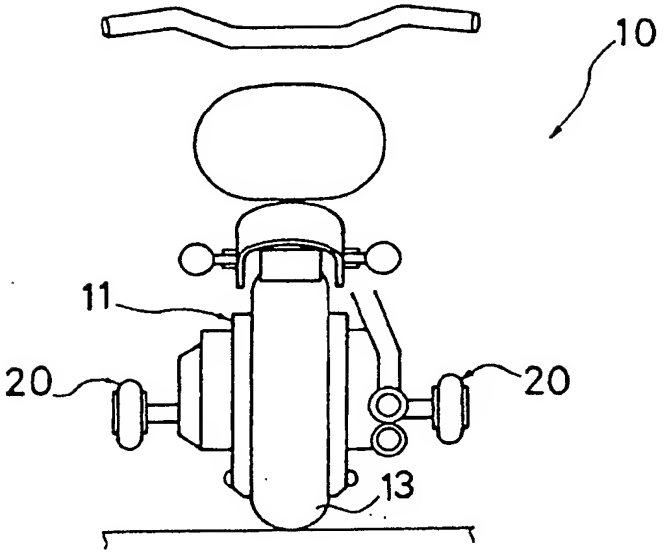


FIG. 10

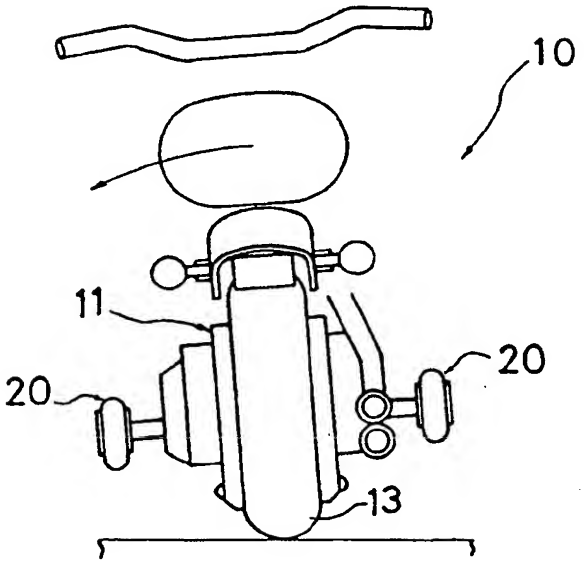


FIG. 11

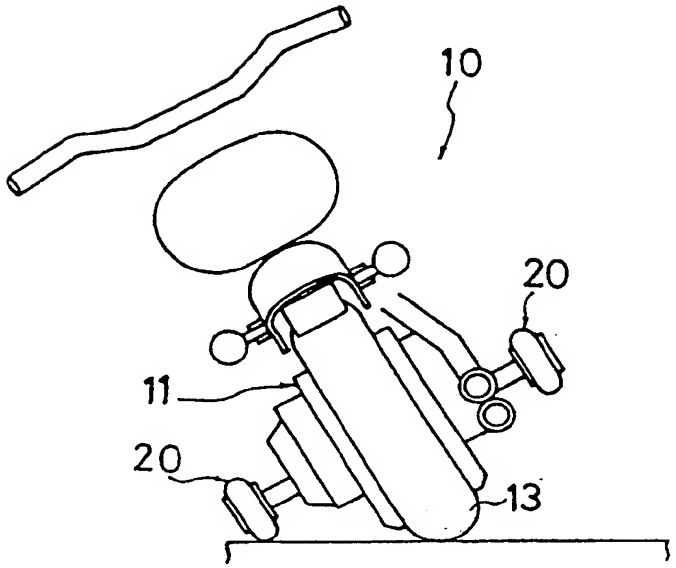


FIG. 12

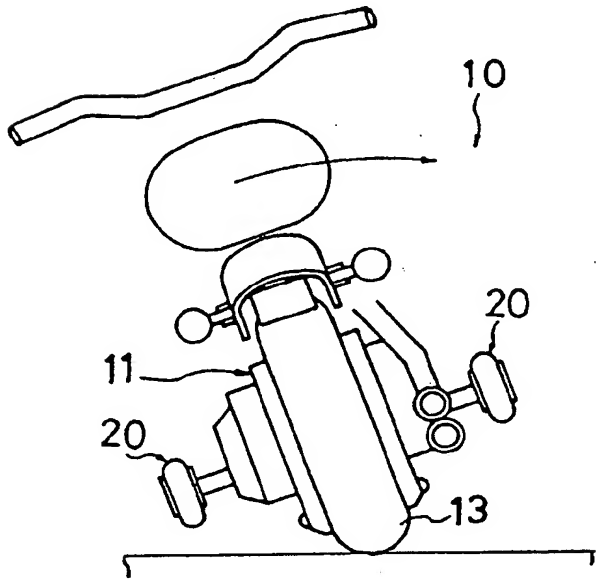


FIG. 13

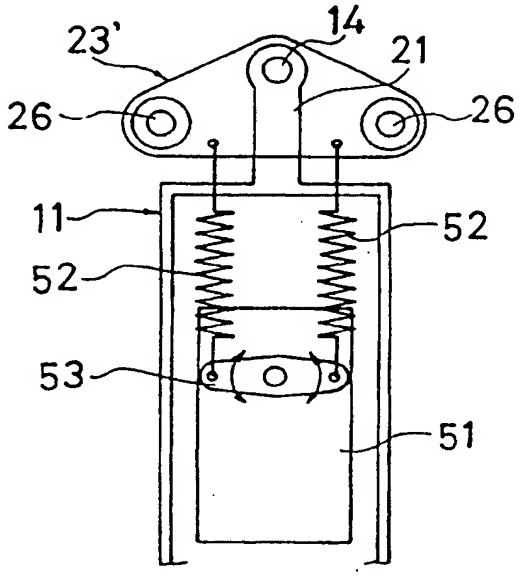
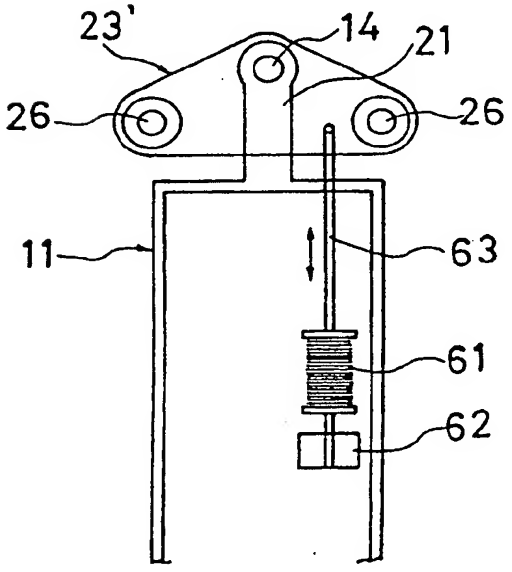


FIG. 14



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 30 5194

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	GB-A-2 087 739 (ICD CORPORATION) * page 1, line 96 - page 2, line 19; figure 3 *	1,3	A63H17/36
P,A	DE-A-43 24 774 (BRINKMANN) * the whole document *	1,3	
A	US-A-4 902 271 (YONEDA) * the whole document *	1,3,5	
A	GB-A-2 199 257 (TALYO) * the whole document *	1,2	
A	DE-B-10 39 898 (LAUBER) * column 3, line 5 - line 12; figure 2 *	4	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

A63H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 October 1995	Vanrunxt, J

CATEGORY OF CITED DOCUMENTS

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